# 40V NPN LOW VCESAT TRANSISTOR IN PowerDI3333-8

## Features

- $BV_{CEO}$ > 40V
- Small Form Factor Thermally Efficient Package.
  Enables Higher Density End Products
- $I_C$ = 2A High Continuous Collector Current
- $I_{CM}$ = 3A Peak Pulse Current
- Low Saturation Voltage $V_{CE(sat)}$ < 220mV @ 1A
- Complementary PNP Type: DXTP22040CFGQ
- Wettable Flank for Improved Optical Inspection
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DXTN22040CFGQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**
  **https://www.diodes.com/quality/product-definitions/**

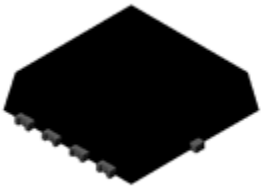
## Mechanical Data

- Case: PowerDI®3333-8
- Case Material: Molded Plastic, "Green" Molding Compound.
  UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads.
  Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.03 grams (Approximate)

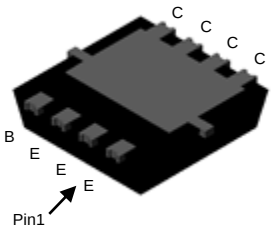
## Applications

- DC to DC Conversion
- Supply Line Switching
- Low Drop Out Regulation
- LCD Backlighting

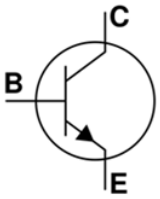
PowerDI3333-8 (SWP) (Type UX)



Top View




Bottom View




Device Symbol

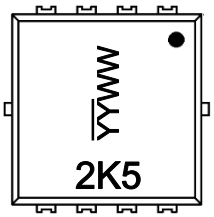
## Ordering Information (Note 4)

| Part Number | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity per Reel |
|---|---|---|---|---|---|
| DXTN22040CFGQ-7 | Automotive | 2K5 | 7 | 12 | 2,000 |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information

PowerDI3333-8 (SWP) (Type UX)




2K5 = Product Type Marking Code
$\overline{YY}$WW = Date Code Marking
$\overline{YY}$ = Last Two Digits of Year (ex: 21 = 2021)
WW = Week Code (01 to 53)

*PowerDI is a registered trademark of Diodes Incorporated.*

## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 50 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 40 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 7 | V |
| Continuous Collector Current | $I_C$ | 2 | A |
| Peak Pulse Collector Current | $I_{CM}$ | 3 | |
| Continuous Base Current | $I_B$ | 100 | mA |
| Peak Pulse Base Current | $I_{BM}$ | 200 | |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

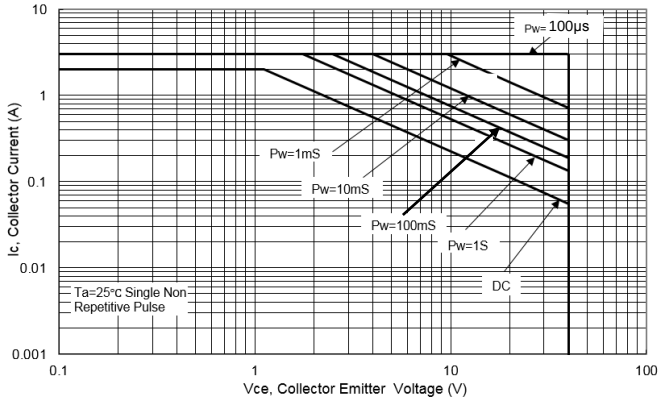
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 5) | $P_D$ | 1.1 | W |
| | (Note 6) | | 2.3 | W |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 113 | °C/W |
| | (Note 6) | | 55 | °C/W |
| Thermal Resistance, Junction to Leads (Note 7) | | $R_{\theta JL}$ | 7.4 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 8)

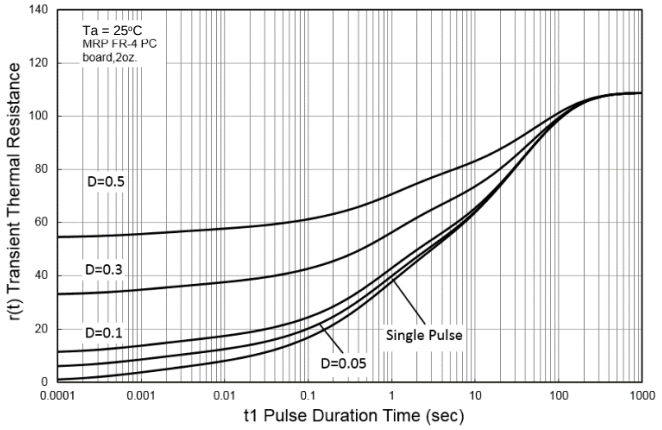
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge – Human Body Model | ESD HBM | 4,000 | V | 3A |
| Charge Device Model | CDM | 1,000 | V | C5 |

Notes:
5. For a device mounted with the collector tab on MRP FR4-PCB; device is measured under still air conditions whilst operating in a steady-state.
6. Same as Note 5, except the device is mounted on 25mm x 25mm 2oz copper.
7. Thermal resistance from junction to solder-point (at the collector tab).
8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

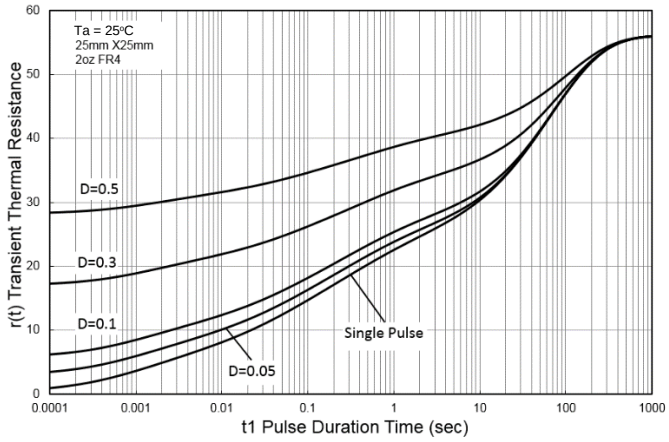
## Thermal Characteristics and Derating Information



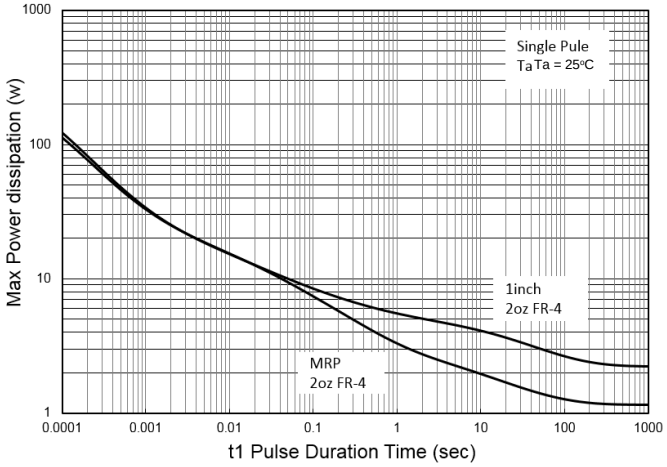

**SOA Safe Operation Area**



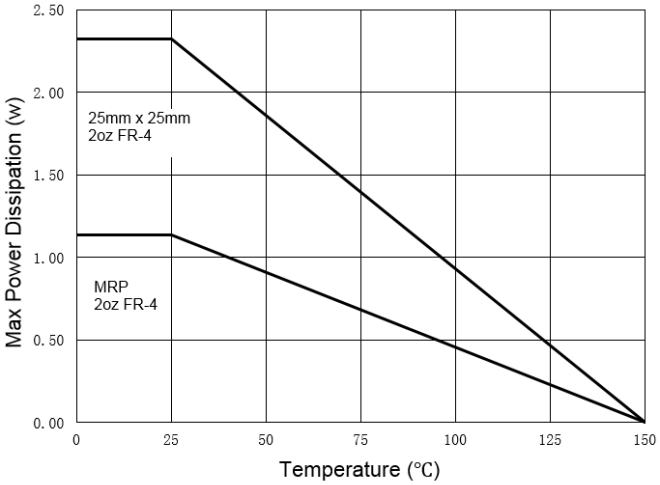

**Transient Thermal Resistance**




**Transient Thermal Resistance**




**Pulse Power dissipation**



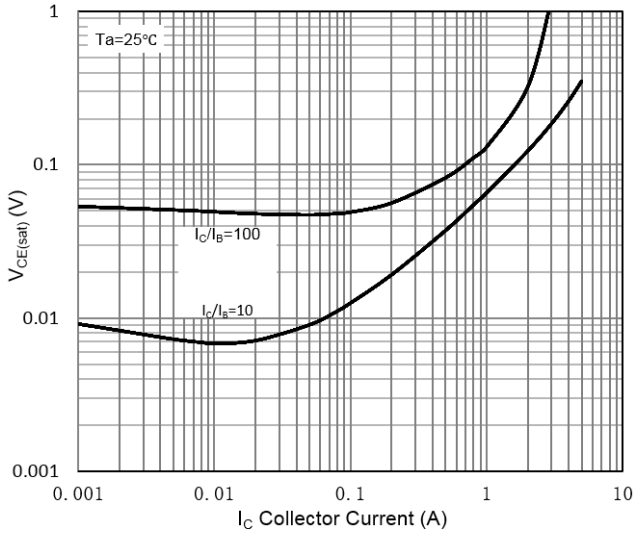

**Derating Curve**

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

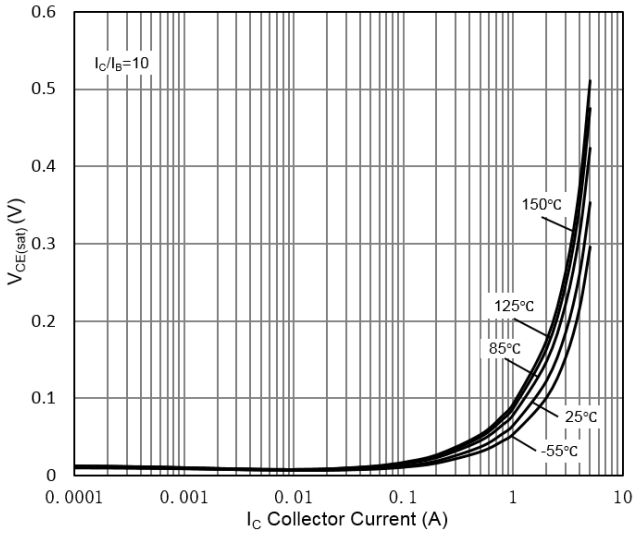
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 50 | 172 | — | V | $I_C$ = 100µA |
| Collector-Emitter Breakdown Voltage (Note 9) | $BV_{CEO}$ | 40 | 54 | — | V | $I_C$ = 10mA |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | 7 | 8 | — | V | $I_E$ = 100µA |
| Collector-Base Cut-Off Current | $I_{CBO}$ | — | 1.5<br>0.06 | 50<br>20 | nA<br>µA | $V_{CB}$ = 50V<br>$V_{CB}$ = 50V, $T_A$ = +150°C |
| Emitter-Base Cut-Off Current | $I_{EBO}$ | — | 1 | 20 | nA | $V_{EB}$ = 6V |
| Collector-Emitter Cut-Off Current | $I_{CES}$ | — | 2 | 50 | nA | $V_{CE}$ = 40V, $V_{BE}$ = 0V |
| Static Forward Current Transfer Ratio (Note 9) | $h_{FE}$ | 200<br>200<br>150<br>80 | 329<br>329<br>305<br>233 | —<br>600<br>—<br>— | — | $I_C$ = 100mA, $V_{CE}$ = 2V<br>$I_C$ = 500mA, $V_{CE}$ = 2V<br>$I_C$ = 1A, $V_{CE}$ = 2V<br>$I_C$ = 2A, $V_{CE}$ = 2V |
| Collector-Emitter Saturation Voltage (Note 9) | $V_{CE(sat)}$ | — | 49<br>37<br>65<br>121<br>180 | 80<br>120<br>220<br>350<br>600 | mV | $I_C$ = 100mA, $I_B$ = 1mA<br>$I_C$ = 500mA, $I_B$ = 50mA<br>$I_C$ = 1A, $I_B$ = 100mA<br>$I_C$ = 2A, $I_B$ = 200mA<br>$I_C$ = 3A, $I_B$ = 300mA |
| Base-Emitter Saturation Voltage (Note 9) | $V_{BE(sat)}$ | — | 0.91 | 1.1 | V | $I_C$ = 1A, $I_B$ = 100mA |
| Base-Emitter Turn-On Voltage (Note 9) | $V_{BE(on)}$ | — | 0.78 | 1 | V | $I_C$ = 1A, $V_{CE}$ = 2V |
| Input Capacitance | $C_{ibo}$ | — | 160 | — | pF | $V_{EB}$ = 0.5V, f = 1MHz |
| Output Capacitance | $C_{obo}$ | — | 11 | — | pF | $V_{CB}$ = 10V, f = 1MHz |
| Transition Frequency | $f_T$ | — | 200 | — | MHz | $I_C$ = 50mA, $V_{CE}$ = 10V<br>f = 100MHz |
| Switching Time | $t_{delay}$ | — | 7.9 | — | ns | $I_C$ = 1A, $V_{CC}$ = 10V,<br>$I_{B1}$ = -$I_{B2}$ = 100mA |
| | $t_{rise}$ | — | 2.9 | — | ns | |
| | $t_{storage}$ | — | 728 | — | ns | |
| | $t_{fall}$ | — | 32.6 | — | ns | |

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

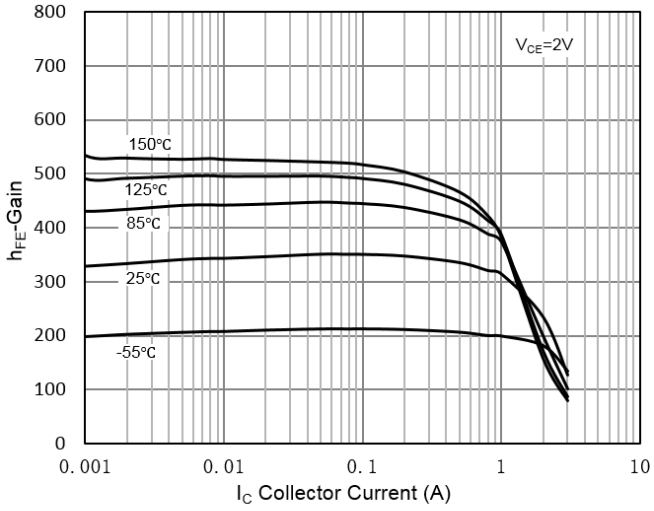
## Typical Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)



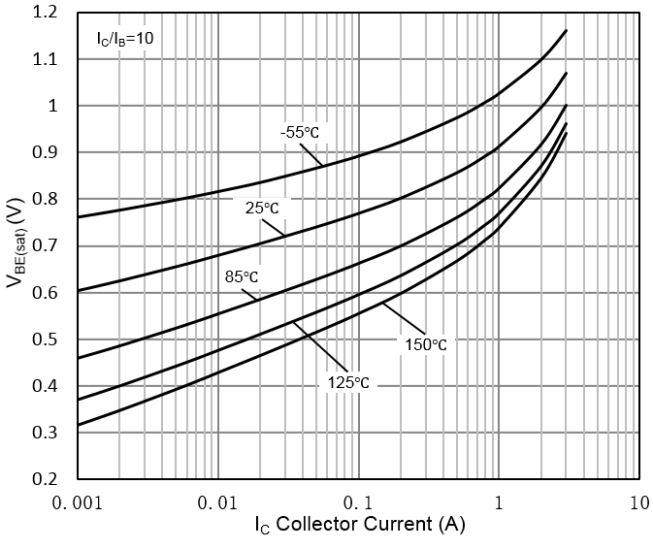

**$V_{CE(sat)}$ vs $I_C$**



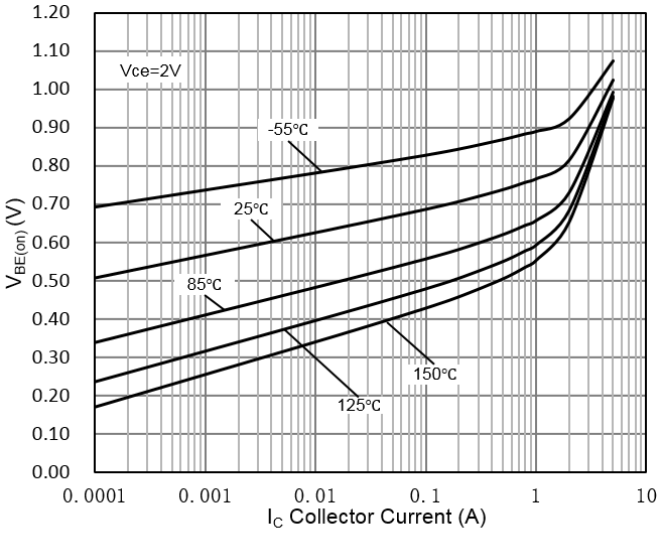

**$V_{CE(sat)}$ vs $I_C$**



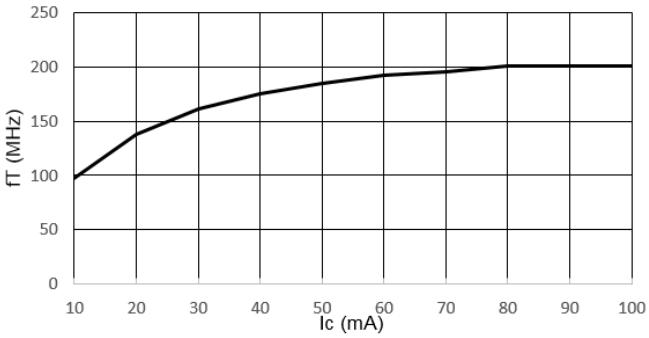

**$h_{FE}$ vs $I_C$**




**$V_{BE(sat)}$ vs $I_C$**




**$V_{BE(on)}$ vs $I_C$**

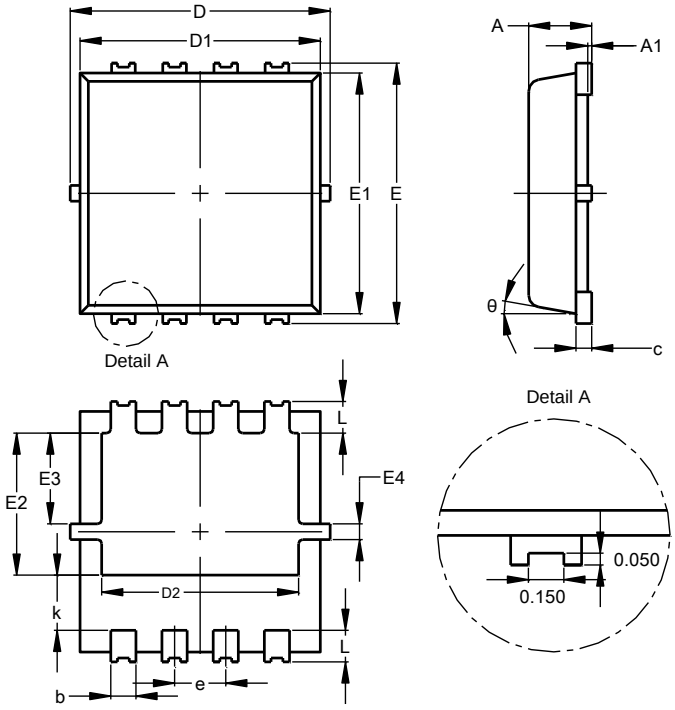



**fT vs Ic**

## Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

**PowerDI3333-8 (SWP) (Type UX)**

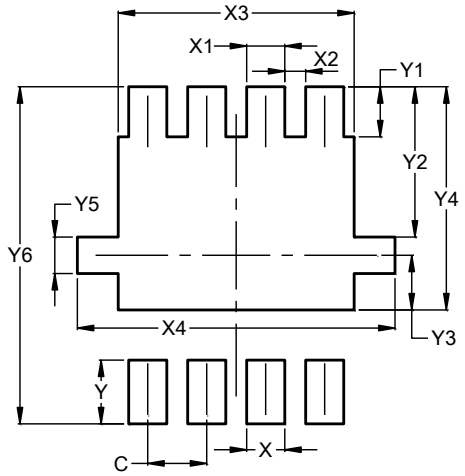



| PowerDI3333-8 (SWP) (Type UX) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.75 | 0.85 | 0.80 |
| **A1** | 0.00 | 0.05 | -- |
| **b** | 0.25 | 0.40 | 0.32 |
| **c** | 0.10 | 0.25 | 0.15 |
| **D** | 3.20 | 3.40 | 3.30 |
| **D1** | 2.95 | 3.15 | 3.05 |
| **D2** | 2.30 | 2.70 | 2.50 |
| **E** | 3.20 | 3.40 | 3.30 |
| **E1** | 2.95 | 3.15 | 3.05 |
| **E2** | 1.60 | 2.00 | 1.80 |
| **E3** | 0.95 | 1.35 | 1.15 |
| **E4** | 0.10 | 0.30 | 0.20 |
| **e** | – | – | 0.65 |
| **k** | 0.50 | 0.90 | 0.70 |
| **L** | 0.30 | 0.50 | 0.40 |
| **θ** | 0° | 12° | 10° |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

**PowerDI3333-8 (SWP) (Type UX)**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **X** | 0.420 |
| **X1** | 0.420 |
| **X2** | 0.230 |
| **X3** | 2.600 |
| **X4** | 3.500 |
| **Y** | 0.700 |
| **Y1** | 0.550 |
| **Y2** | 1.650 |
| **Y3** | 0.600 |
| **Y4** | 2.450 |
| **Y5** | 0.400 |
| **Y6** | 3.700 |

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